IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Brovelli et al
Serial No: 09/575,307
Filing Date: May 19, 2000
Examiner: Michael V. Meller
Group Art: 1654
For: ECHINACEA INDUCTION OF PHASE II ENZYMES

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 C.F.R. §1.131

We declare that:

1. We are co-inventors of the patent application identified above.

2. Prior to May 9, 2000, we had completed the invention as described and claimed in the subject application in this country as evidenced by the following:

   a. the Invention Conception Record and accompanying attachments submitted to the Alticor Legal Department (formerly Amway Corporation) (attached as Exhibit 1);
   b. Lab notebook pages from one inventor, Kari Truax, (attached as Exhibit 2).

3. The Invention Conception Record and its accompanying figures show that, prior to May 9, 2000, we conceived of and reduced to practice a procedure for inducing phase II enzymes with chloroform-soluble *Echinacea purpurea* fractions as described and claimed in the subject application.

4. Additionally, Kari Truax's lab notebook pages outline the steps she performed to reduce our invention to practice in the Nutrilite Laboratories at 19600 6th Street, Lakeview, CA 92567-8403. These steps conform with Figure 1 and Pages 6-7 of the subject application and further support that, prior to May 9, 2000, we conceived of and reduced to practice, a procedure for inducing phase II enzymes with chloroform-soluble fractions of *Echinacea purpurea* as described and claimed in the subject application.

5. Each of the dates redacted from Exhibits 1 and 2 are prior to May 9, 2000.

6. We hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued therefrom.

Ernesto Brovelli, Ph.D — Date: 10-3-04

Yingqin Li — Date: 10/4/04

Kari Fitzgerald (maiden name – Truax) — Date

Puri David — Date: 10/3/04

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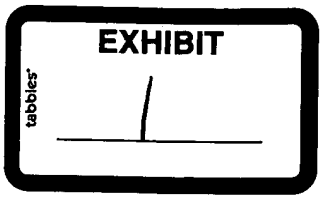
Ernesto Brovelli, Ph.D	Date
Yingqin Li	Date
Kari Fitzgerald (maiden name – Truax)	10/8/04 Date
Puri David	Date



Amway Corporation
Invention Conception Record

A. Title of your invention.

Phase II Enzyme Induction by *Echinacea* Extract and Its Fractions

B. Describe your invention including specific embodiments and alternatives, ranges and products, and process/apparatus variations. Include photographs, sketches, flow sheets, or other drawings where appropriate.

We have found that certain *Echinacea purpurea* extracts and some of its fractions induce the expression of Phase II enzyme. The extracts found to induce the expression of this enzyme are derived from both the aboveground organs and the roots.

On that basis, experimentation was further refined to determine the level of induction for *Echinacea purpurea* fractions extracted with solvents of different polarity. It was determined that for aboveground organs, it is the petroleum ether fraction that results in the greatest induction of phase II enzyme. For roots, it is the chloroform fraction that brings about maximum induction.

C. Describe what problem was solved and how you solved it. Describe how your invention differs from art you are aware of and describe the advantages of your invention.

To our knowledge, and based on an extensive literature review, there is no previous knowledge about this kind of mechanism in *Echinacea*.
The induction of phase II enzymes has extremely important implications for the human body. These enzymes have detoxyfying activity of potential carcinogens.
In addittion to *Echinacea*'s well-documented immunomodulatory functions, this finding can extend the activity of *Echinacea* as a cancer chemopreventive agent.

D. When did you first think of this invention?

On redacted we thought that the recently developed prototypes might have Phase II enzyme properties and decided to submit them to a bioassay.

E. What records do you have to document when you first thought of this invention?

Laboratory notebook.

F. To whom did you first disclose this invention?

Kha Tran

G. On what date did you make this disclosure?

redacted

H. When did you first do any actual experimental work concerning the invention?

redacted

I. Who has observed the progress of your experimental work?

Rodney Johnson & Kevin Gellenbeck.

J. Are there other ICRs now on file or contemplated, yours or others, that tie in closely with this invention?

No.

K. Has panel or consumer testing been conducted?

Yes _____ No.___X__ If yes, when? Describe the testing.

L. Are there any plans for consumer or panel testing?

Yes _____No.___X__ If yes, when? give details.

Not in the immediate plans.

M. Give dates and details regarding any samples, sales, information, or publications relating to this invention which have been or will be given to persons outside Amway Corporation.

No information has been disclosed to outside parties.

N. Are you aware of any pertinent literature or patent references? Give details.

None whatsoever.

O. Is commercial use imminent? If yes, indicate the anticipated earliest date of commercial use.

The extracts are currently being manufactured by Nutrilite/Amway, although with the purpose of enhancing the immune system.
This is an extremely novel function for this herb and it would be advantageous to exploit this benefit commercially.

NOTE: IF ANY CHANGES TO THE ABOVE INFORMATION OCCUR, ADVISE A MEMBER OF THE PATENT REVIEW TEAM IMMEDIATELY.

Inventor Ernesto A. Brovelli Signed redacted
month, day, year

Inventor Yong Quian Signed
month, day, year

Inventor Puri G. David Signed redacted
month, day, year

Inventor Kari L. Truax Signed redacted
month, day, year

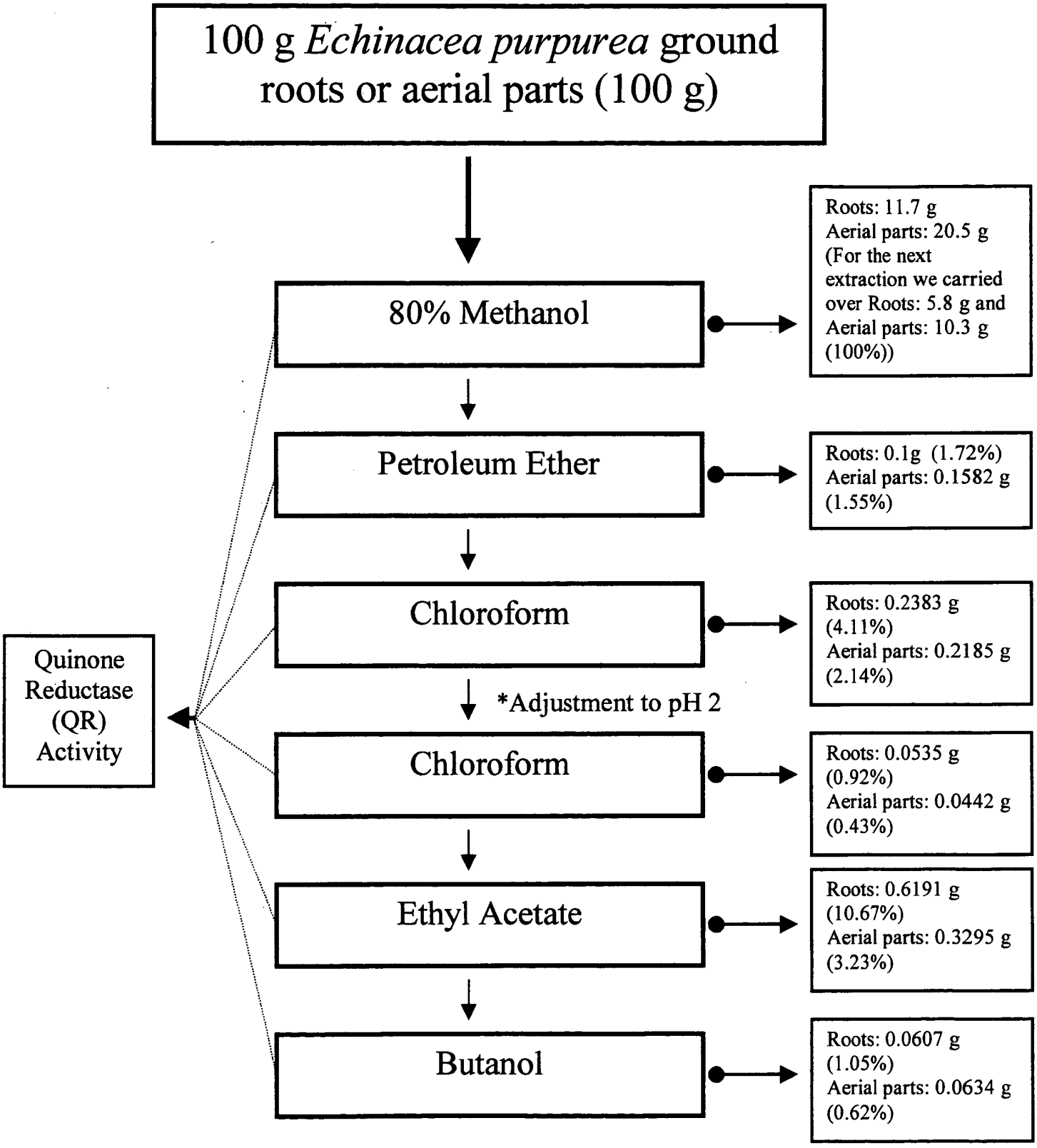
Inventor Yingqin Li Signed redacted
month, day, year

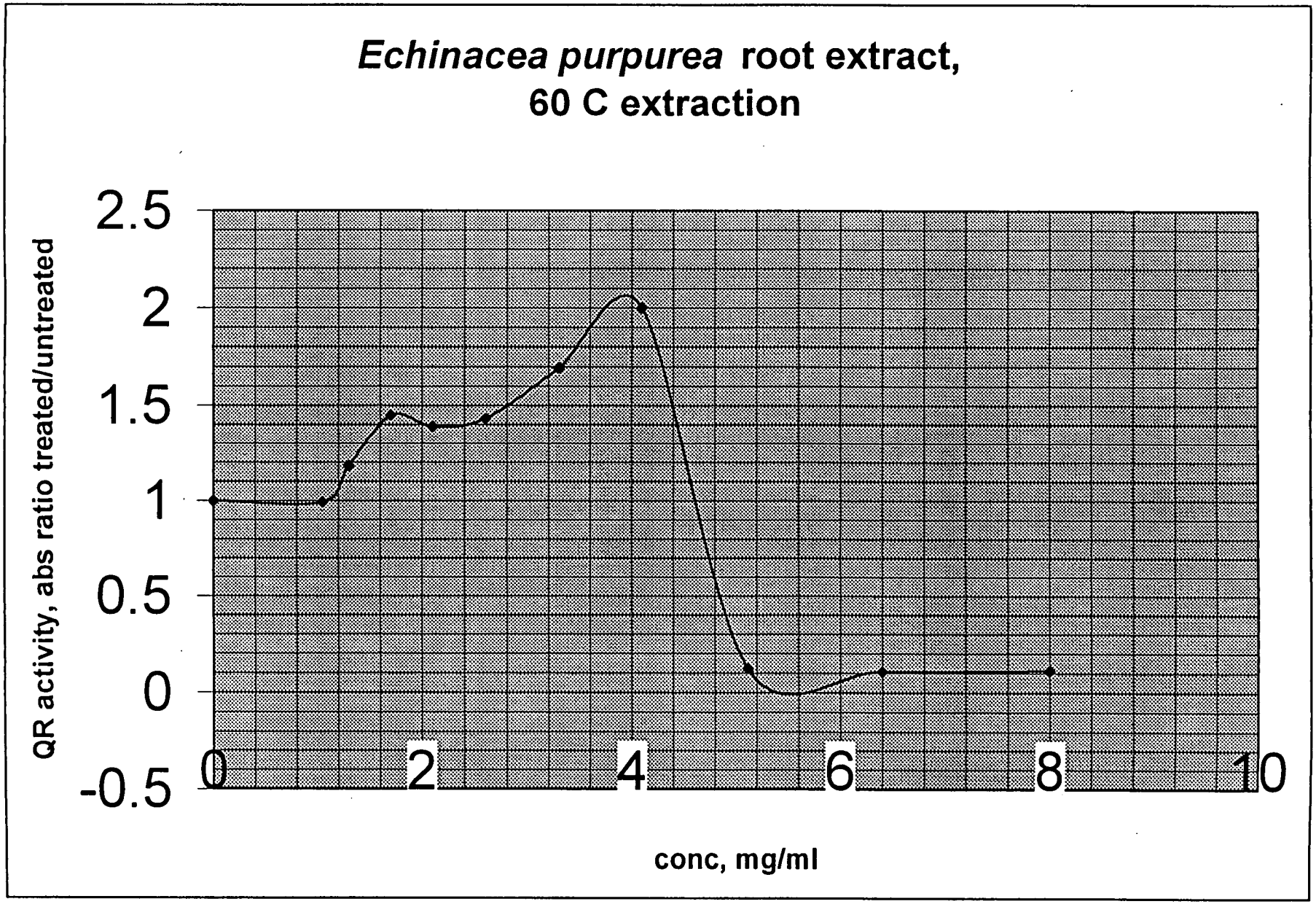
The foregoing signed disclosure was read and understood by me on the date hereinafter set forth.

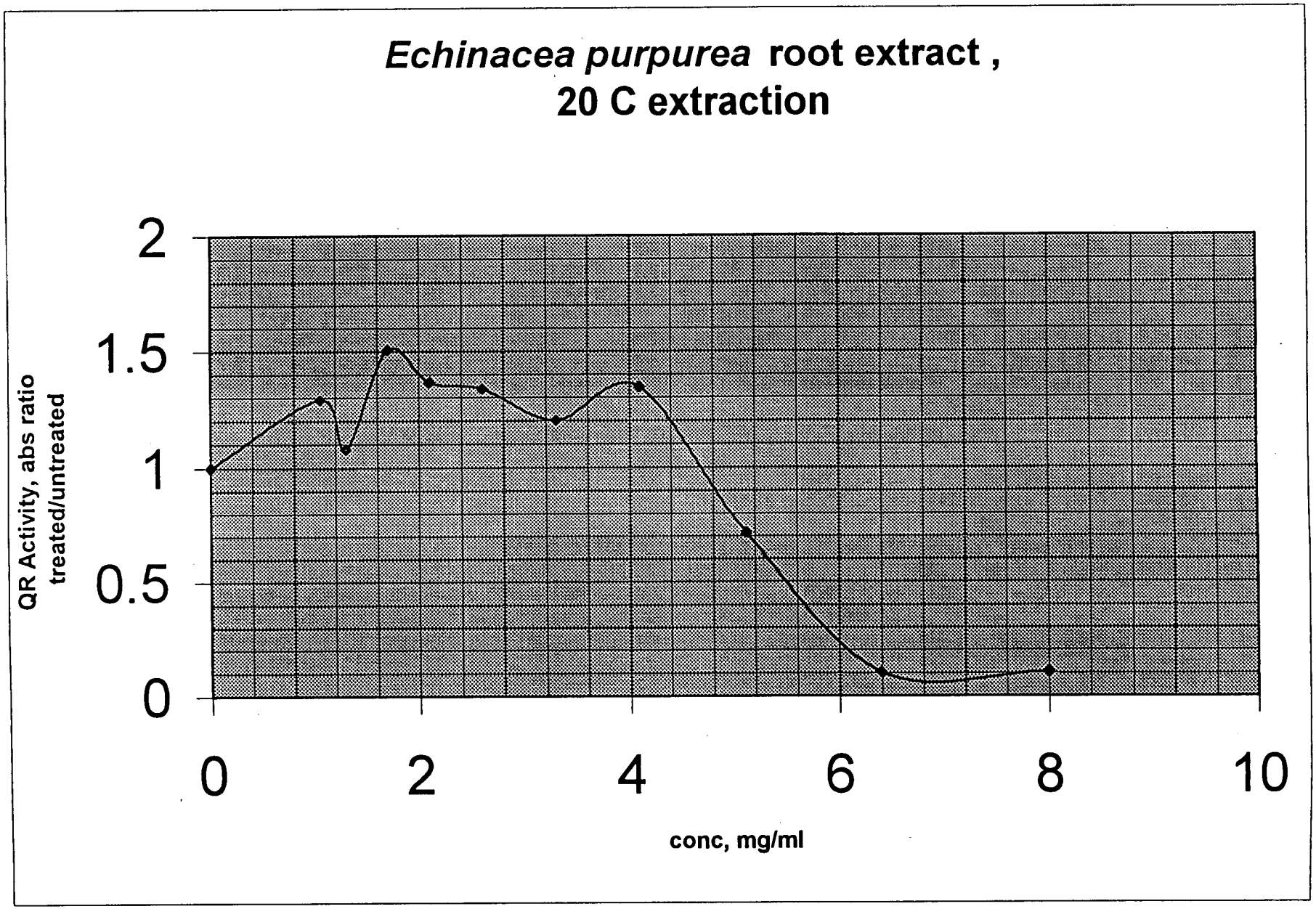
Witness Signed redacted
month, day, year

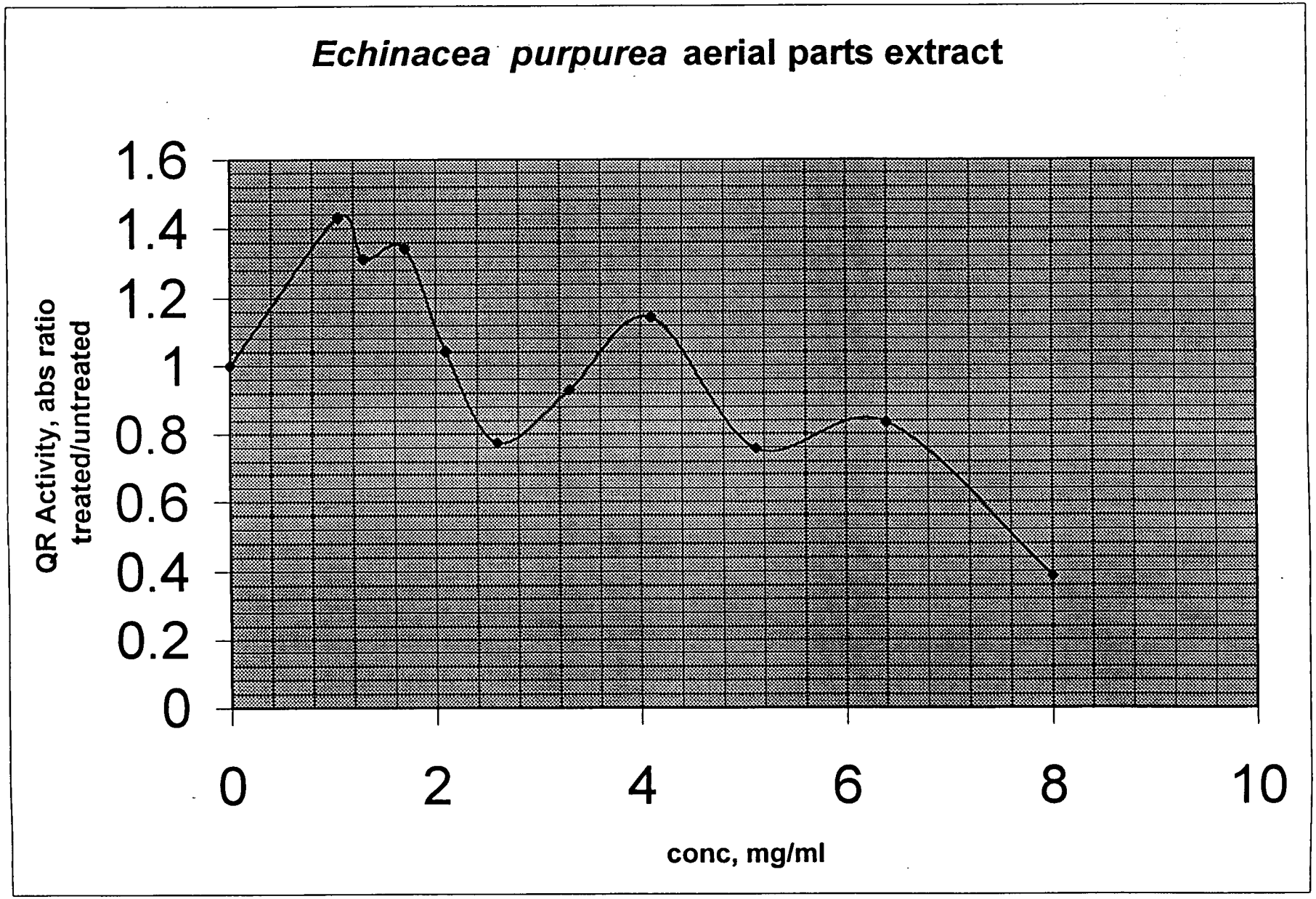
Witness Signed
month, day, year

Extraction Protocol

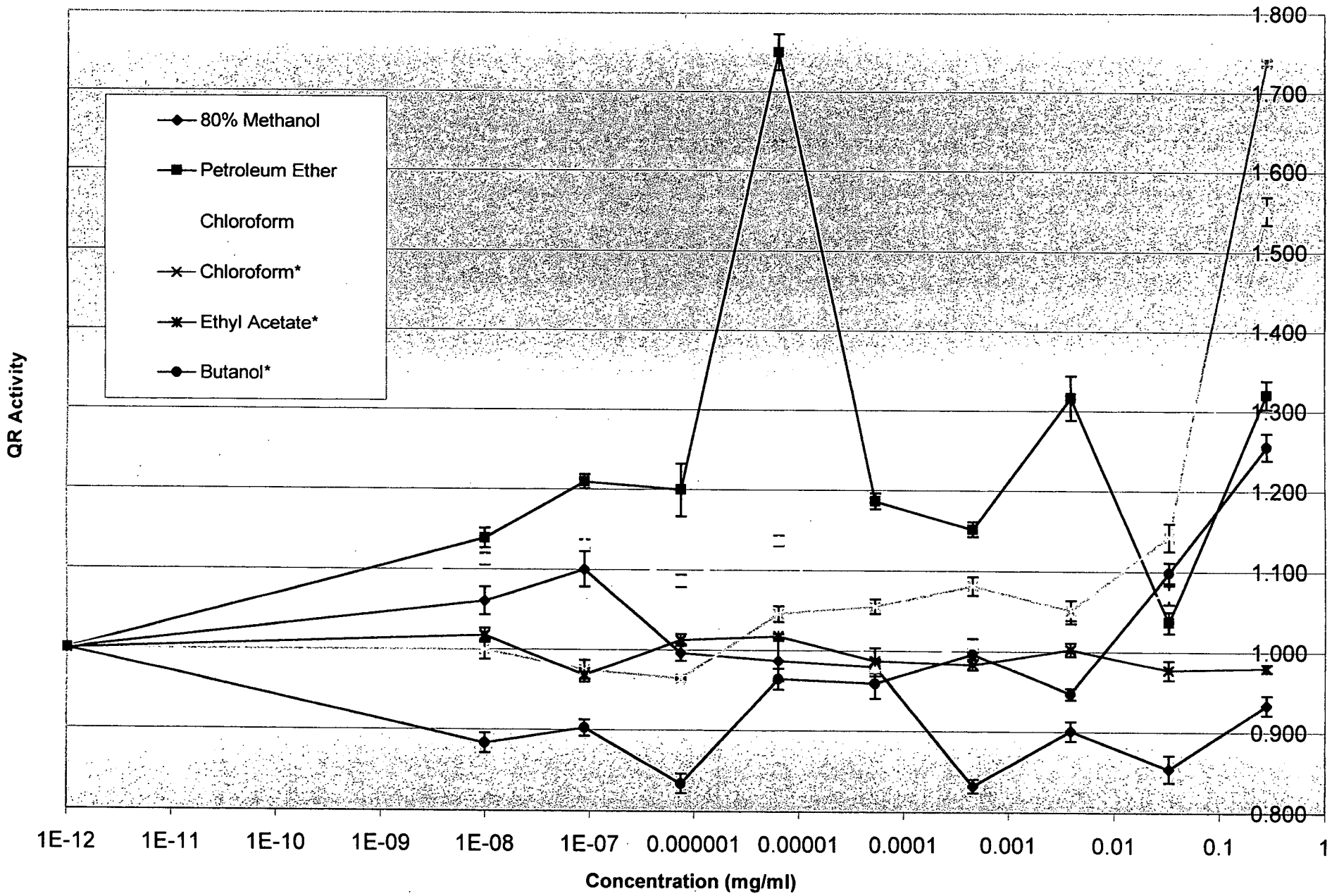



Echinacea purpurea root extract,
60 C extraction
QR activity, abs ratio treated/untreated
2.5
2
1.5
1
0.5
0
-0.5
0
2
4
6
8
10
conc, mg/ml


Echinacea purpurea root extract ,
20 C extraction
QR Activity, abs ratio
treated/untreated
2
1.5
1
0.5
0
0
2
4
6
8
10
conc, mg/ml

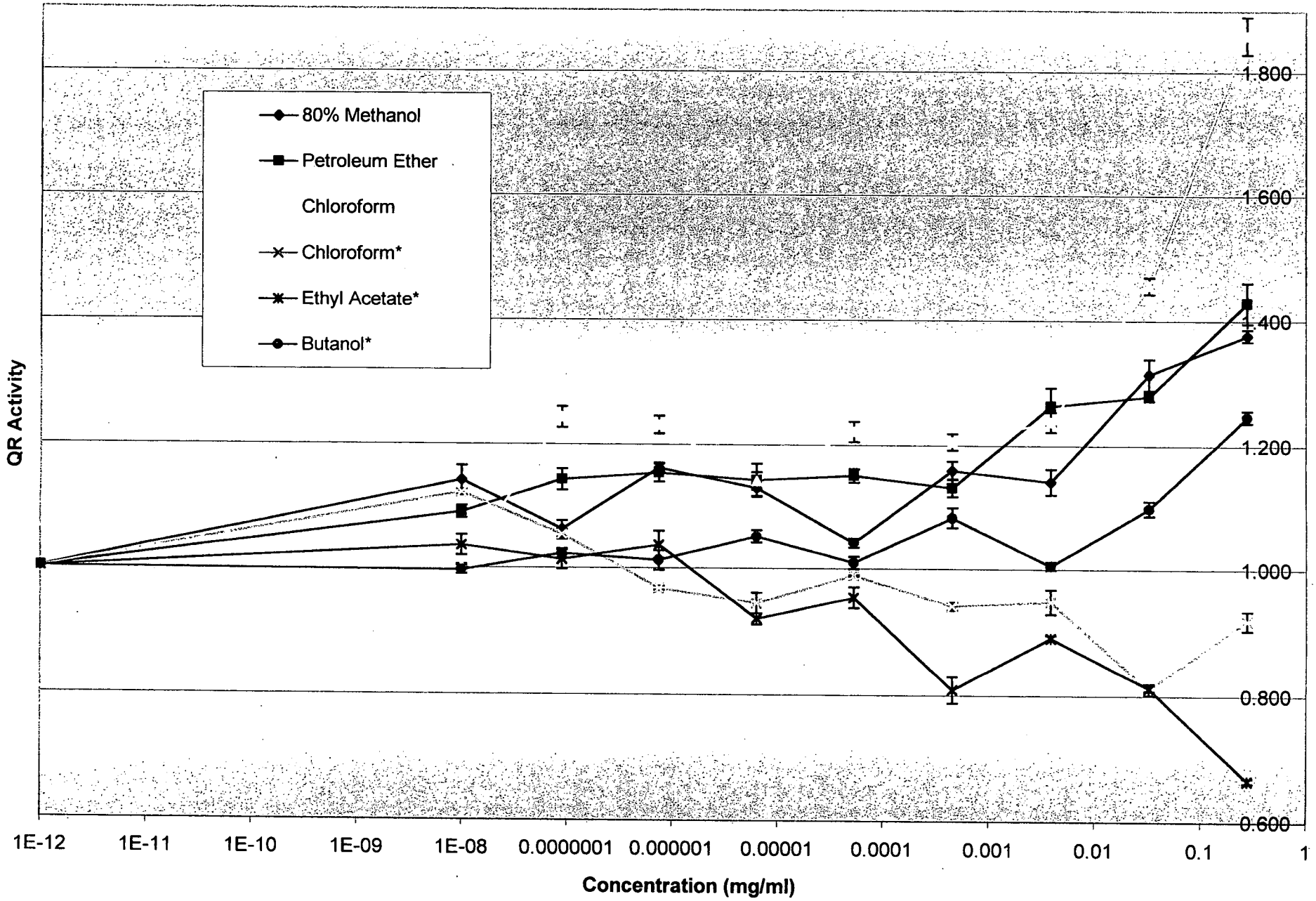

Echinacea purpurea aerial parts extract
QR Activity, abs ratio
treated/untreated
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
conc, mg/ml

Induction of Quinone Reductase by *Echinacea purpurea* Aerial Fractions



* The aqueous residue was acidified to pH 2.

Induction of Quinone Reductase by *Echinacea purpurea* Root Fractions



* The aqueous residue was acidified to pH 2.

Continued from page ____

Extraction II Protocol

EXHIBIT tabbies 2

Protocol is from:

~~Maffei-Facino, R., Carini, M. et al. (1995) Echinacoside + Caffeoyl conjugate PROTOCOL~~

Maffei-Facino, R., Carini, M., Aldini, G., et al. (1995) Direct characterization of caffeoyl esters w/antihyaluronidase activity in crude extracts from E.a. roots by fast atom bombardment tandem mass spectrometry. Farmaco 48(10) 1447-1461.

100g Roots or Tops

by 80% MeOH twice

500ml x 2 times

① Condense 60min

② Condense 40min

Extract

Dry ↓ evaporate @ 30-40% C

R=11.7g T=20.5g

Residue ____ g

↓ add 100ml H_2O + sonicate until homogenous

Residue + H_2O ____ g R=5.8g T=10.2g

↓ Fractionate (separatory Funnel)

① Petroleum Ether 100ml x 3 → Na_2SO_4 → evaporate

R=0.1g 1.72% T=0.1582g 1.55%

② Chloroform ~~Methyl Chloride~~ 100ml x 3 → Na_2SO_4 → evaporate

R=0.2383g 4.11% T=0.2185g 2.14%

③ Adjust pH of H_2O to 2 using HCl

Fractionate

④ Ethyl Acetate 100ml x ? → H_2O 50x2 wash → Na_2SO_4 → evap

R=0.6191 10.67% T=0.3295g 3.23%

⑤ Butanol (100ml x 3) → H_2O 50x2 wash → Na_2SO_4 → evap

1.05% R=0.0607g 0.62% T=0.0634g

⑭ ~~Methylene~~ Chloroform ~~Chloride~~ (100ml x 3) → H_2O 50x2 wash → Na_2SO_4 → evap

T=.0442 R=0.0535 T=0.2185 0.92% 0.43% g

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 6813

Day 2: PII Enzyme - Treat w/samples

Continued from page ____

Day 2: Tuesday

Prepare α MEM (w 10% calf serum + 1% antibiotic)

Prepare the samples:

#1 Brassica concentrate

100mg sample / 10 ml α MEM (w/calf serum + antibiotic)

= 10mg/ml

#2 E. p. Roots

- 50mg sample / 10ml α MEM (w/calf serum + antibiotic)

= 5mg/ml

- 100mg sample / 10ml α MEM (w/ " ")

= 10mg/ml

#3 E. p. Tops

- 50mg sample / 10ml α MEM (w/ " ")

= 5mg/ml

- 100mg sample / 10ml α MEM (w/ " ")

= 10mg/ml

#4 E. p. concentrate

50mg sample / 10ml α MEM (w/ " ")

= 5mg/ml

#5 E. p. concentrate

100mg sample / 10ml α MEM (w/ " ")

= 10mg/ml

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Day 2: PII Enzyme - Treatment

- Vortex all of the samples for ≈ 2 minutes
- Then centrifuge @ speed 6 for ≈ 10 minutes (IEC Clinical Centrifuge)

Treatment w/ samples:

1.) Remove all of the old α MEM medium from the 96 well plates.

2.) To lanes 1 + 2 add 300 ul α MEM medium, to lanes 3-12 add 150 ul α MEM medium.

3.) Add 100 ul sample to lane 12, pipet up + down 4 times, remove 100 ul from lane 12 + put into lane 11, pipet up + down 4 times, remove 100 ul from lane 11 + put into lane 10 pipet up + down 4 times ... continue this through lane 3 @ lane 2 once all is mixed (4 times) remove 100 ul + discard.

4.) Repeat step #3 using 100 ul of new sample.

5.) Add 150 ul of α MEM medium to lanes 3-12, to make all wells have a final volume of 300 ul.

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signed _____ date _____

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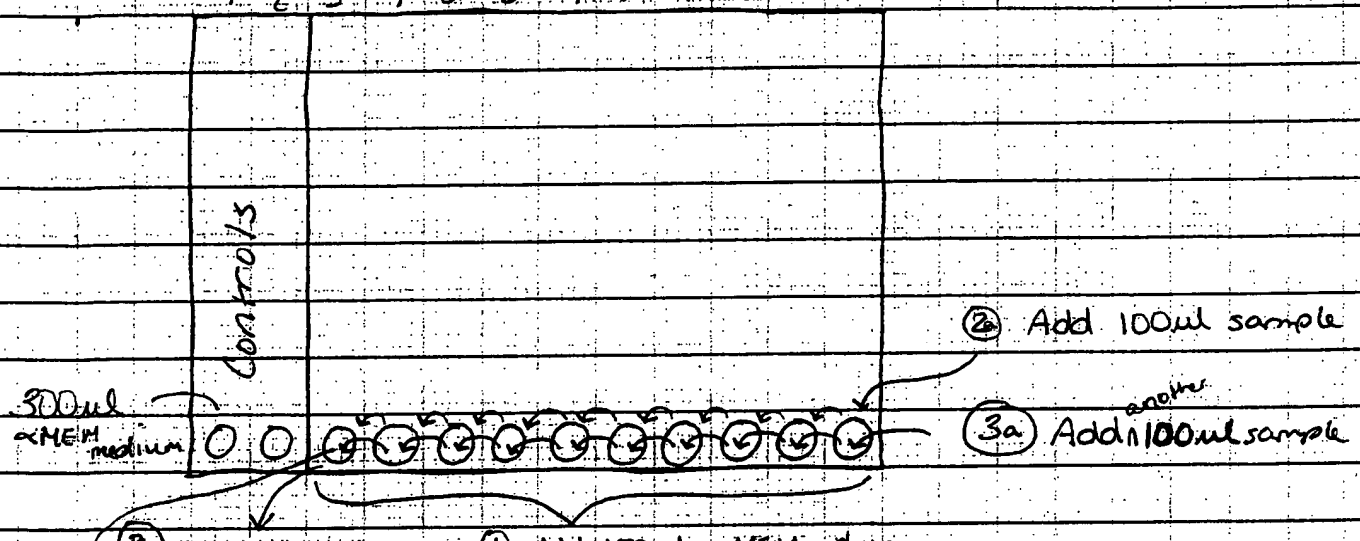
Day 2: PII Enzyme - Treatment w/samples

Continued from page ____

6.) Incubate @ 37°C for 48 hrs.

96 well plate:



4 Make sure @ the end that all wells have 300ul total (Add 150ul αMEM medium to lanes 3-12 after treating w/ sample)

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Day 2: PII Enzyme - Treatment of samples

Continued from page ____

Plate #1: Brassica Concentrate (10mg/ml)

923 brac dat

controls	10mg/ml

- capture image save as 92399br.cpf

Plate #2: E. purpurea Roots (5 + 10mg/ml)

923eproots.dat

controls	5mg/ml
	10mg/ml

92399er.cpf

Plate #3: E. purpurea Tops (5 + 10mg/ml)

923eptops.dat

controls	5mg/ml
	10mg/ml

92399et.cpf

Plate #4: E. purpurea concentrate (5mg/ml)

923epc50.dat

controls	5mg/ml

92399ec5.cpf

Plate #5: E.p. concentrate (10mg/ml)

923epc100

controls	10mg/ml

92399ec1.cpf

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signed _____ date _____

Day 3 : Wednesday - I was sick, did not need to prepare cocktail, it was prepared last time + stored in freezer.

Day 4 : Thursday - Reading + Evaluation of Results

1.) Look @ wells under microscope. Note if any of the concentrations caused cell death.
* do this b/4 decanting wells + adding Rxn cocktail

Plate #1 : Brassica concentrate (10mg/ml)
Lane 9 - start to see dark cells - maybe dead but when I move the plate they don't move
↓ keep seeing more + more through lane 12
Lane 12 :

Plate #2 : E. purpurea roots
5mg/ml
Lane 12 see some dark cells same as brassica concentrate
other lanes look fine
10mg/ml
Lane 9 start to see dark cells
↓ keep seeing more + more
Lane 12

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noted in this inner margin at any time.

Day 4: PTE Enzyme Assay

Continued from page ____

Plate #3 E. purpurea Tops

5mg/ml

Lane 10 - start to see dark cells

↓

Lane 12 - ↑ dark cells

10mg/ml

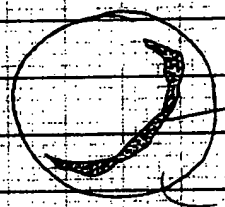
= Lane 2 start to see dark cells

↓

Lane 12 ↑ dark cells, still not that much

Plate #4 E. purpurea concentrate (5mg/ml)

- see a lot of the cells grouped together - dark brown - do not look attached but when you shake the wells - they don't move, also see attached cells



cells brown (don't appear to be floating)

also see attached cells

Plate #5 E. purpurea concentrate (10mg/ml)

- same as plate appear the same as plate #4

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Day 4: PII Enzyme Assay

Cocktail - thaw → before assay add 100 units glucose 6-phosphate dehydrogenase + 50 ul 50mM Menadione in acetonitrile per 50ml Cocktail (previously prepared)

Enzyme Assay:

1.) Wash wells as completely as possible

2.) Add 30ul of 0.8% digitonin in 2mM EDTA (pH 7.1) to all wells + incubate 10min @ 37°C to lyse cells. Then 10min (@ 25°C) w/ 100rpm shaking (Orbital Shaker) to release enzymes
⇒ Orbital Shaker setting @ 4

3.) Add 100ul Cocktail + start timing (2-10min) * 5minutes this time *

4.) Stop the rxn by adding 30ul of 0.3mM dicoumarol in 0.5% DMSO + 5mM KH_2PO_4 (pH 7.4)

5.) Read plate @ 610nm + record OD values using microtiter plate reader.

Evaluate Data next week

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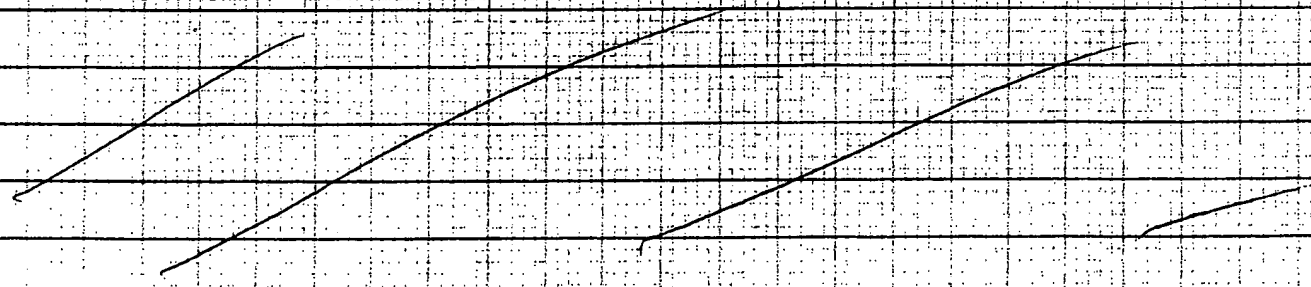
Day 4: Thursday - Enzyme Assay

Continued from page ____

Cocktail: Thaw; Before assay add 100 units glucose 6 phosphate dehydrogenase and 5ml of 50mM Mercaptoethanol in Acetonitrile
⇒ per 50 ml aliquot of previously prepared cocktail

Enzyme Assay
Follow the steps on pg 77

Evaluate Data:
=
Record Appearance of wells
See notebook # 7104



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Day 4: Evaluation of Results

Continued from page 77

#9 Chloroform pH 8 Roots (20mg/ml)

10799 cr2 ~~CR2~~

Control:

Mean OD = 0.671 Std Dev = 0.043 CV = 6.342

20ul	$3.65e^{-11}$	$5.44e^{-10}$	$8.12e^{-9}$	$1.21e^{-7}$	$1.81e^{-6}$	$2.7e^{-5}$	$4.03e^{-4}$	0.006	0.0898	1.34
Conc (mg/ml)	$2e^{-9}$	$2e^{-8}$	$2e^{-7}$	$2e^{-6}$	$2e^{-5}$	$2e^{-4}$	$2e^{-3}$	$2e^{-2}$	0.2	2
Mean OD	0.753	0.707	0.650	0.635	0.664	0.632	0.637	0.544	0.617	0.242
Std Dev.	0.020	0.031	0.014	0.064	0.004	0.026	0.078	0.037	0.060	0.084
CV	2.620	4.334	2.165	10.10	0.643	4.165	12.25	6.726	9.754	34.85
QR Activity	1.122	1.054	0.969	0.946	0.990	0.942	0.949	0.811	~~0.994~~ 0.920	0.361

8ul	$2e^{-9}$	$2e^{-8}$	$2e^{-7}$	$2e^{-6}$	$2e^{-5}$	$2e^{-4}$	$2e^{-3}$	$2e^{-2}$	0.2	2
Conc (mg/ml)	$3.65e^{-11}$	$5.44e^{-10}$	$8.12e^{-9}$	$1.21e^{-7}$	$1.81e^{-6}$	$2.7e^{-5}$	$4.03e^{-4}$	0.006002	0.0898	1.34
Mean OD	0.663	0.635	0.571	0.595	0.627	0.557	0.602	0.611	0.606	0.275
Std Dev.	0.064	0.051	0.077	0.038	0.064	0.040	0.041	0.042	0.049	0.035
CV	9.596	8.111	13.40	6.353	10.27	7.252	6.877	6.912	8.162	12.79
QR Activity	0.988	0.946	0.851	0.887	0.934	0.830	0.897	0.911	0.903	0.410

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Day 4: Evaluation of Results

#10 Chloroform pH2 Tops (20mg/ml)

10799 ct 2

Control:

Mean OD = 0.610 Std Dev = 0.049 CV = 8.081

20ul	$3.65e^{-11}$	$5.44e^{-10}$	$8.12e^{-9}$	$1.21e^{-7}$	$1.81e^{-6}$	$2.7e^{-5}$	$4.03e^{-4}$	0.006	0.0898	1.34
Conc (mg/ml)	$2e^{-9}$	$2e^{-8}$	$2e^{-7}$	$2e^{-6}$	$2e^{-5}$	$2e^{-4}$	$2e^{-3}$	$2e^{-2}$	$2e^{-1}$	2
Mean OD	0.610	0.595	0.588	0.638	0.644	0.660	0.642	0.697	1.061	0.286
Std Dev	0.048	0.049	0.006	0.040	0.038	0.046	0.050	0.070	0.014	0.039
CV	7.807	8.234	0.935	6.338	5.932	7.030	7.798	10.05	1.282	13.77
QR Activity	1.0	0.975	0.964	1.046	1.056	1.082	1.052	1.143	1.739	0.469

30ul	$2e^{-9}$	$2e^{-8}$	$2e^{-7}$	$2e^{-6}$	$2e^{-5}$	$2e^{-4}$	$2e^{-3}$	$2e^{-2}$	0.2	2
Conc (mg/ml)	$3.65e^{-11}$	$5.44e^{-10}$	$8.12e^{-9}$	$1.21e^{-7}$	$1.81e^{-6}$	$2.7e^{-5}$	$4.03e^{-4}$	0.00603	0.0898	1.34
Mean OD	0.611	0.642	0.618	0.638	0.623	0.679	0.712	0.737	0.961	0.380
Std Dev	0.047	0.049	0.021	0.026	0.058	0.030	0.062	0.038	0.101	0.006
CV	7.733	7.620	3.357	4.110	9.312	4.484	8.648	5.196	10.49	1.493
QR Activity	1.002	1.052	1.013	1.046	1.021	1.113	1.167	1.208	1.575	0.623

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